WHAT IS CLAIMED IS

1.   An apparatus for coding an image while scrambling the image by randomizing pixel values, comprising a scrambling unit to scramble an image by utilizing an encryption function to compute a displacement of a pixel value to be randomized in response to a displacement of a previously randomized pixel value.

2.   The apparatus as claimed in claim 1, wherein the scrambling unit adjusts the displacement of the pixel value to be randomized according to how many effective bits are present in a value of the encryption function.

3.   The apparatus as claimed in claim 1, wherein the scrambling unit adjusts the displacement of the pixel value to be randomized according to a factor of degree.

4.   The apparatus as claimed in claim 1, wherein the scrambling unit computes the displacement of the pixel value to be randomized in response to a password as well as the displacement of the previously randomized pixel value.

5.   The apparatus as claimed in claim 1, further comprising a compression coding unit to generate a code sequence by performing compression coding with respect to the image, and includes a plurality of functional stages, wherein the scrambling unit is provided at a predetermined stage along a series of the plurality of functional stages, each

stage of the plurality of functional stages following the predetermined stage being reversible.

6.   The apparatus as claimed in claim 5, wherein the compression coding unit performs the compression coding with respect to the image according to JPEG2000.

7.   The apparatus as claimed in claim 5, further comprising a digital-watermark embedding unit to embed, into the code sequence, information about the scrambling and the compression coding of the image as digital watermarking.

8.   The apparatus as claimed in claim 1, wherein the scrambling unit computes the displacement of the pixel value to be randomized in response to a displacement of an immediately preceding randomized pixel value.

9.   The apparatus as claimed in claim 6, wherein the compression coding unit performs the compression coding with respect to the image according to an irreversible mode of JPEG2000, and wherein the scrambling unit is situated after a stage for coefficient quantization and randomizes a quantized discrete wavelet transform.

10.   The apparatus as claimed in claim 6, wherein the compression coding unit performs the compression coding with respect to the image according to a reversible mode of JPEG2000, and wherein the scrambling unit is situated prior to a stage for discrete wavelet transform for randomizing of the pixel value.

11.   The apparatus as claimed in claim 9, wherein the scrambling unit

scrambles the image with respect to significant coefficients of bit coefficients that are

discrete wavelet transform coefficients quantized into bitplanes.

12.   The apparatus as claimed in claim 11, wherein the scrambling unit inverts

a bit coefficient for the scrambling, and, together therewith, inverts an adjacent-order bit

coefficient.

13.   The apparatus as claimed in claim 11, wherein the scrambling unit is

capable of adjusting a scrambling level with respect to the quantized discrete wavelet

transform coefficients.

14.   The apparatus as claimed in claim 13, wherein the scrambling unit is

capable of adjusting the scrambling level in accordance with selection of a bit position of

the bit coefficients that are the discrete wavelet transform coefficients quantized into

bitplanes.

15.   The apparatus as claimed in claim 13, wherein the scrambling unit is

capable of adjusting the scrambling level in accordance with selection of a hierarchical

level of sub-bands generated by discrete wavelet transform.

16.   The apparatus as claimed in claim 13, wherein the scrambling unit is capable of adjusting the scrambling level in accordance with selection of size of a block for which the scrambling is performed when a plurality of rectangular areas are provided as units of processing of discrete wavelet transform.

17.   An apparatus for decoding codes, comprising:

a decoding unit to decode scrambled code data into an image, and includes a plurality of functional stages, the scrambled code data being scrambled by the apparatus of claim 1; and

a descrambling unit, provided at a predetermined stage along a series of the functional stages, to descramble the scrambled code data.

18.   A method of scrambling an image by randomizing pixel values, comprising scrambling an image by utilizing an encryption size of a block for which the scrambling is performed when a plurality of rectangular areas are provided as processing units of a discrete wavelet transform.

19.   An apparatus for decoding codes, comprising:

a decoding unit to decode scrambled code data into an image, and includes a plurality of functional stages, the scrambled code data being scrambled by the apparatus of claim 1; and

a descrambling unit, provided at a predetermined stage along a series of the functional stages, and to descramble the scrambled code data.

20.   A method of scrambling an image by randomizing pixel values,

comprising scrambling an image by utilizing an encryption function to compute a

displacement of a pixel value to be randomized in response to a displacement of a

previously randomized pixel value.

21.   A method of decoding codes, comprising:

decoding scrambled code data into an image, wherein decoding the scrambled

code data is performed in a plurality of stages, the scrambled code data being scrambled

by the method of claim 18; and

descrambling the scrambled code data, wherein descrambling the scrambled code

data is performed at a predetermined stage along a series of the stages.

22.   An article of manufacture comprising one or more recordable media

having instructions stored thereon which, when executed by a computer, cause the

computer to perform a method for scrambling an image by randomizing pixel values by

utilizing an encryption function to compute a displacement of a pixel value to be

randomized in response to a displacement of a previously randomized pixel value.

23.   The article of manufacture as claimed in claim 22, wherein scrambling the

image comprises adjusting the displacement of the pixel value to be randomized

according to how many effective bits are present in a value of the encryption function.

24.   The article of manufacture as claimed in claim 22, wherein scrambling the image comprises adjusting the displacement of the pixel value to be randomized according to a factor of degree.

25.   The article of manufacture as claimed in claim 22, wherein scrambling the image comprises computing the displacement of the pixel value to be randomized in response to a password as well as the displacement of the previously randomized pixel value.

26.   The article of manufacture as claimed in claim 22, wherein the method further comprises generating a code sequence by performing compression coding with respect to the image using a plurality of functional stages, wherein scrambling the image is performed at a predetermined stage along a series of the functional stages, each stage of the functional stages following the predetermined stage being reversible.

27.   The article of manufacture as claimed in claim 26, wherein generating the code sequence is performed according to JPEG2000.

28.   The article of manufacture as claimed in claim 26, wherein the method further comprises embedding into the code sequence information about the scrambling and the compression coding of the image as digital watermarking.

29.   The article of manufacture as claimed in claim 22, wherein scrambling the image comprises computing the displacement of the pixel value to be randomized in response to a displacement of an immediately preceding randomized pixel value.

30.   The article of manufacture as claimed in claim 27, wherein generating the code sequence is performed according to an irreversible mode of JPEG2000, and wherein the scrambling unit is performed after a stage for coefficient quantization, and randomizes a quantized discrete wavelet transform coefficient.

31.   The article of manufacture as claimed in claim 27, wherein generating the code sequence is performed according to a reversible mode of JPEG2000, and wherein scrambling the image is performed prior to a stage for a discrete wavelet transform for randomizing of the pixel value.

32.   An article of manufacture comprising one or more recordable media having instructions stored thereon which, when executed by a computer, cause the computer to perform a method for decoding codes, the method comprising:

decoding scrambled code data into an image according to JPEG2000, using a plurality of functional stages, the scrambled code data being scrambled by the method of claim 20; and

descrambling the scrambled code data.